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PROPOSED RELOCATION OF SWITCHYARD  
PULSED VERTICAL TRIM MAGNETS

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## Introduction

The enhanced slow spill (pinged beam) normally sent to the N7 line for transport to the bubble chambers must be steered around the switchyard splitting stations. This is accomplished by a set of pulsed ferrite magnets located in the transfer hall, "B" enclosure and the "G1" stub. The operational goal of the pulsed magnet (PVTs) system is to (1) keep the pinged beam in the neutrino channel of the electrostatic splitters, and (2) to uncouple the pinged beam vertical position and angle at the "G3" manhole from changes in the proton and meson splitting station tune.

## Splitting Station Deflections

At a given splitting station the pinged beam encounters 4 vertical deflections whose strengths are roughly proportional to the fraction of slow beam split off from the neutrino (G-Line) line. The electrostatic deflection arising from the wire septa fields are cancelled magnetically by fixed components in the MVT 92 and MVT 103 magnet currents. To first order, the 4 vertical bumps are designed to perform as 2 opposing doglegs, with the second dogleg producing about  $-1/2$  the vertical translation of the first.

Whenever the Proton/Neutrino split ratio is changed additional adjustment of the meson splitting station bumps is required. As a result, 8 vertical deflections seen by the neu-

trino line are varied in a linear algorithm for proton/neutrino split ratio changes, while only 4 vertical deflections are varied for meson/neutrino split ratio changes.

The maximum deflection seen by the neutrino line beam occurs when 100% of the slow beam is sent to either the proton or meson area. The table below lists the maximum vertical deflections seen at a given splitting station. These values correspond to vertical beam translations of 6.0 mm. and 9.5 mm. at the proton and meson electrostatic septa respectively.

#### Maximum Deflections Seen by $\nu$ Line from Splitting Stations

P Split Algorithm				M Split Algorithm			
(Ft) "Z"	Magnet	mrad $\Delta\theta$	Amps $\Delta I/400 \text{ GeV/c}$	(Ft) "Z"	Magnet	mrad $\Delta\theta$	Amps $\Delta I/400 \text{ GeV/c}$
114	MVT 90	0.160	+45.0	550	MVT 101	+.240	+67.0
203	91	-.068	+45.0	658	102	-.103	+67.0
242	92	-.026	-7.4	730	103	-.044	-12.6
540	100	+.025	6.4	1152	104	+.016	+ 4.0
550	101	-.083	-23.3				
658	102	+.036	-23.3				
730	103	+.0106	+ 3.0				
1152	104	-.0058	-1.45				

With the addition of a third proton septum in the transfer hall, the resulting shift in MQ 90-91 results in a larger deflection required for the initial proton split bumps. The first two bumps in the proton algorithm become:

"Z"	Magnet	mrad	Amps/400 GeV*
114	MVT 90	0.2	54.0
184	MVT 91	-0.1	27.0

\*Note: at 140 turns

## Proposed pulsed magnet arrays-

The most useful location for the PVT magnets was found to be near the first and third bumps of both splitting stations. In addition a PVT magnet was placed in "G1" manhole to provide final trimming before the G3 septum area. The compensation for the proton split mult bumps is accomplished by 3 PVT magnets. Figure 1 shows the pinged beam vertical translation from the neutrino line optical axis when a 100% split to the proton area occurs. The resulting compensation of this deflection is shown for (A) 2 PVT magnets at Z=108 and 189 ft. In the transfer hall (PVT 90 and PVT 91) the pinged beam is brought to the optical axis at both electrostatic septa areas, but has a small residual oscillation which appears as a pure angle at the G3 septum. This oscillation is effectively cancelled by a very small deflection at Z=733 ft. (PVT 103) as shown in Figure 3.

The uncompensated meson splitting station deflections are shown in Figure 4. The compensating system for this split algorithm is also 3 PVT magnets, located at Z=530 (PVT 101), Z=733 (PVT 103) and Z=1671 (PVT 110). Figure 5 shows the compensated pinged beam trajectory.

Note that PVT 103 is used in both proton 8-bump and meson 4-bump compensation, and would require a negative deflection for a 100% split to proton and no beam to meson. Thus bipolar operation is required for this magnet.

# Conclusions:

Maximum deflections for the 5 PVT pinged-beam compensating magnets are given below for the conditions of 100% split to proton or meson area.

"Z" (Ft.)	Name	Max. Defln. mrad	Function
108	PVT 90	-0.20	proton mult 8 compensation
189	PVT 91	0.135	
733	PVT 103	-0.013	
530	PVT 101	-0.19	Meson mult 4 compensation
733	PVT 103	0.114	
1671	PVT 110	-0.010	

Gen B: proton Muon B: Max Defn. (No comp<sup>n</sup>)

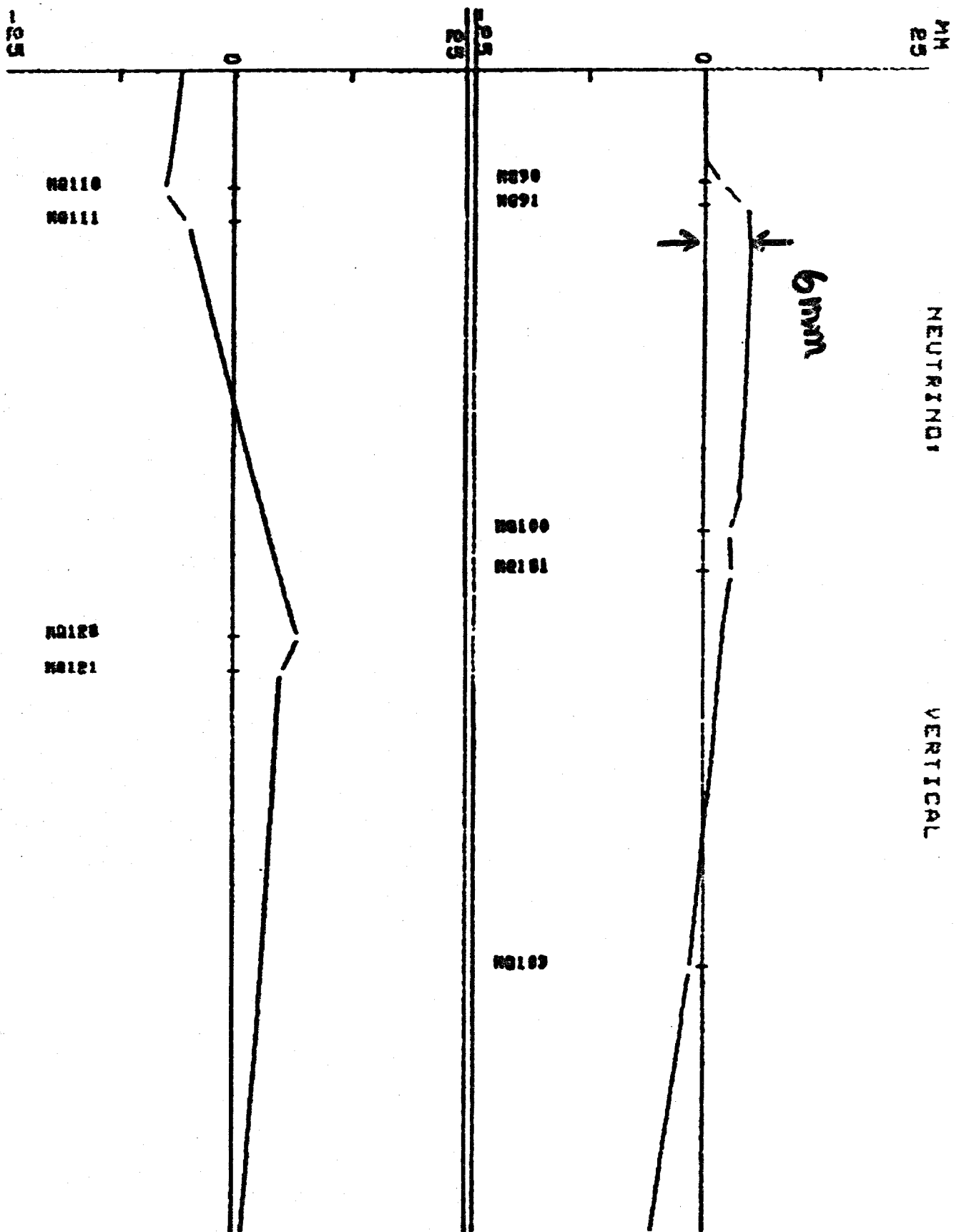


FIGURE 1

GeomB: proton MultB 2 PVT comps

NEUTRINO: VERTICAL

$$PVT90 = (-.2 \pm .135) m.$$

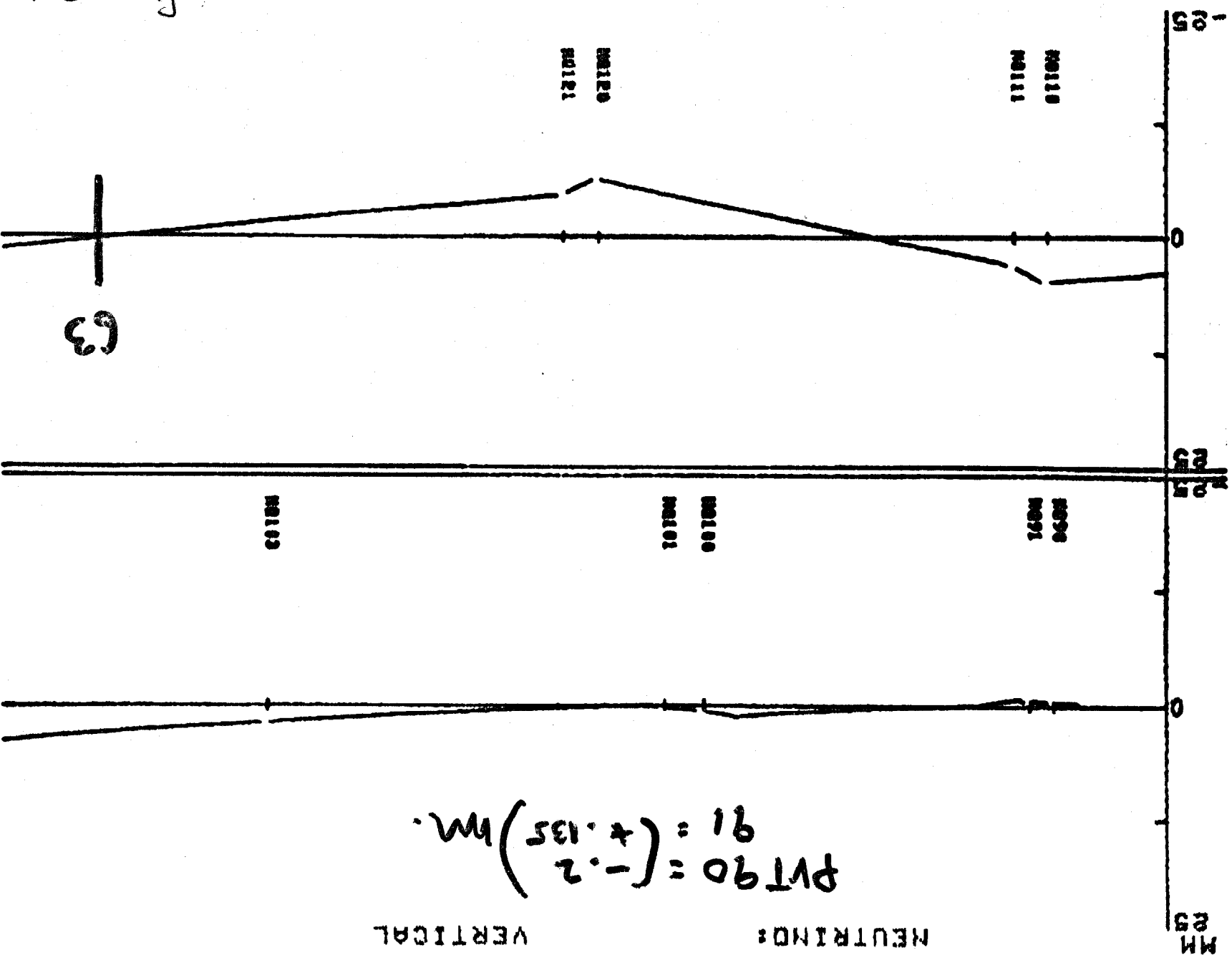


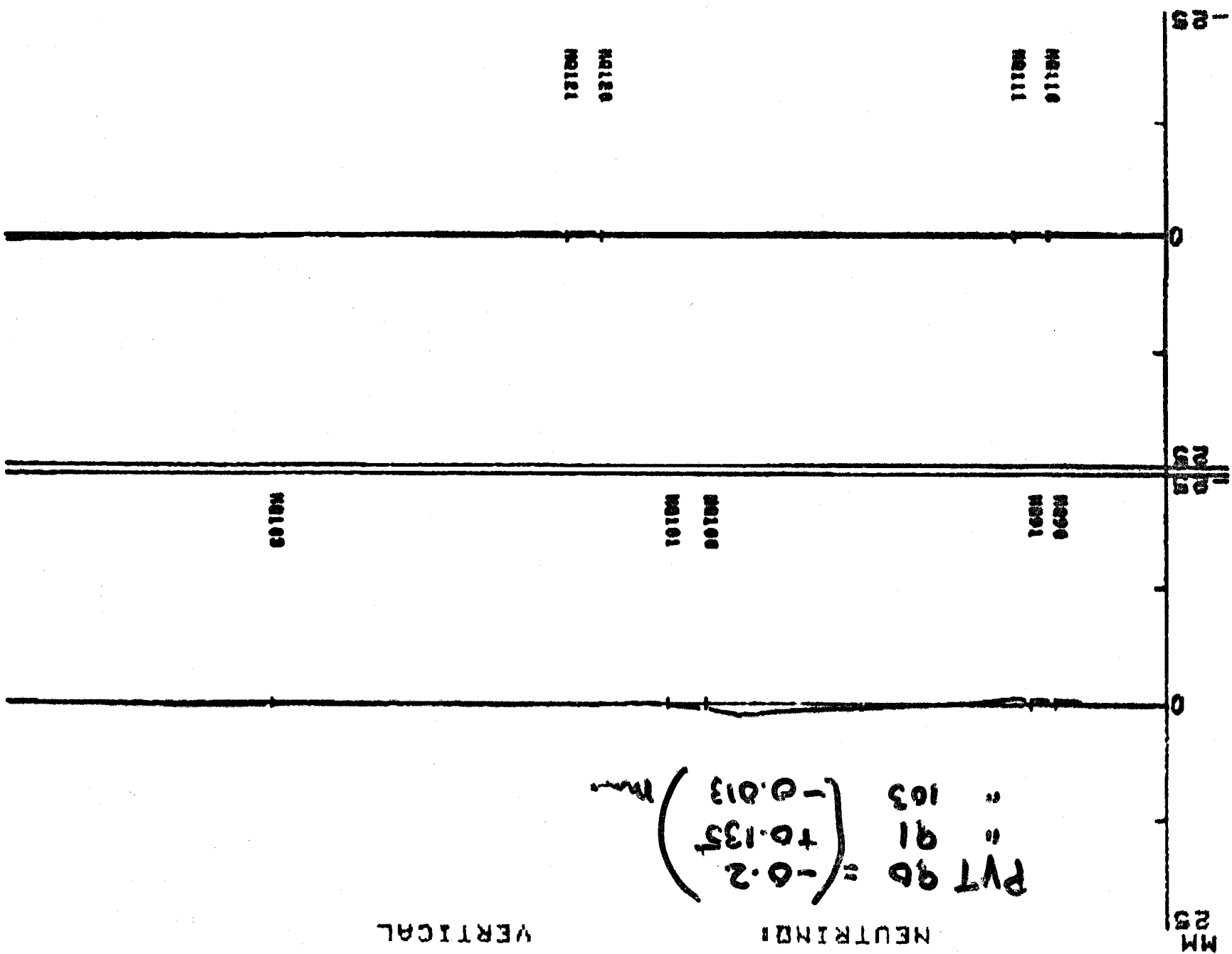
figure 2 A

# Geomb proton Mult 8 comp: 3 PVT comp.

NEUTRINO  
VERTICAL

$$PVT\ 90 = \begin{pmatrix} -0.2 \\ +0.135 \\ -0.013 \end{pmatrix} m$$

" 91  
" 103



MM  
23

NEUTRINO:

VERTICAL

PVT 103 → angle cont'd ab  
G3 septum

PVT 103

2=733

10104  
10103

10104  
10103

10104

23  
23

-23

10110  
10111

10120  
10121

63

G3 member

figure 3.

MESON SPLIT: MULT 4: Max. Defln:  $y = 9.5 \text{ mm. at MSEP}$

NEUTRING:

VERTICAL

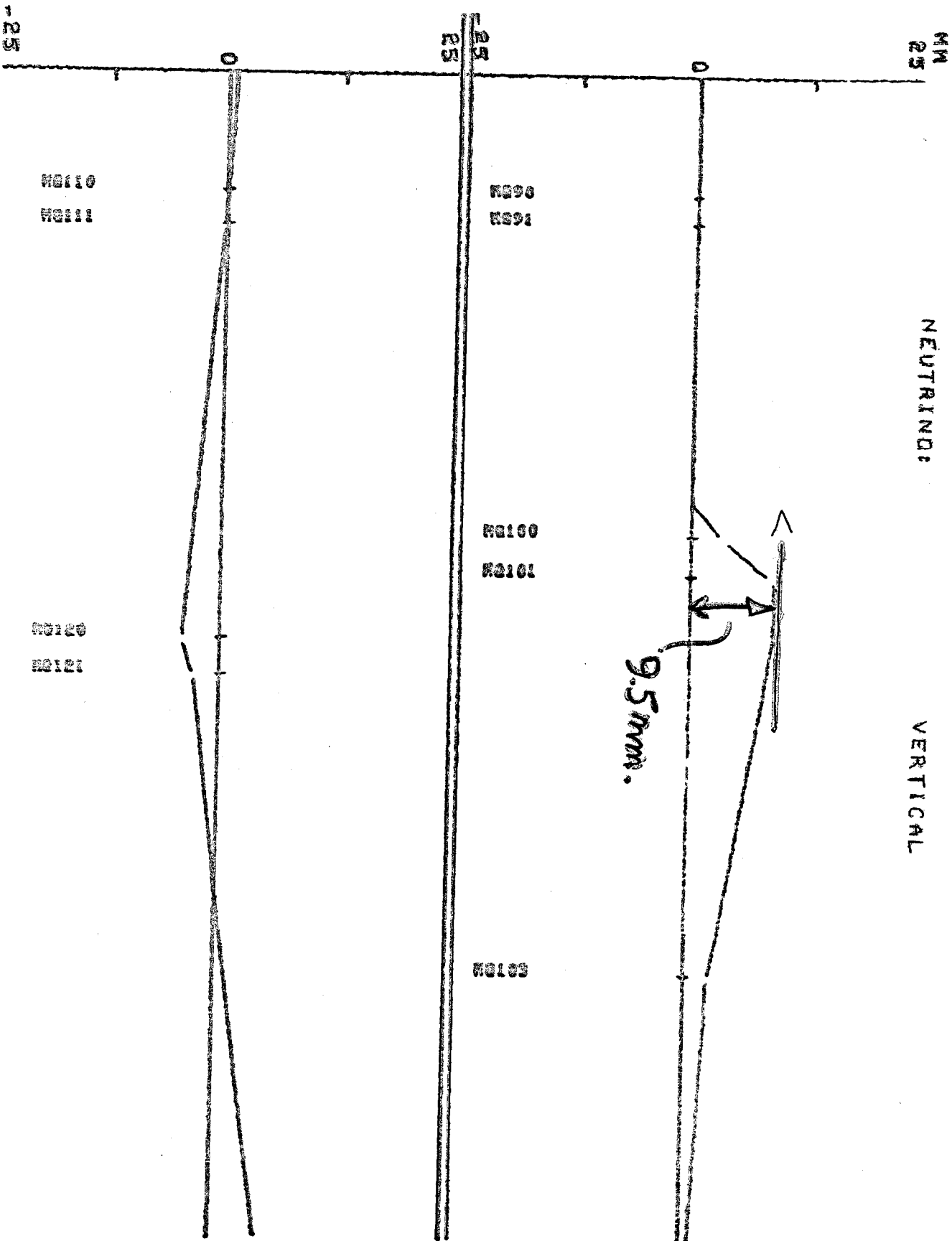


Figure 4.

# Meson Split-Mult 4 : PVT compn: A/B

PVT 101 = -0.19  
 " 103 = 0.114  
 " 110 = 0.010

NEUTRINO  
 VERTICAL

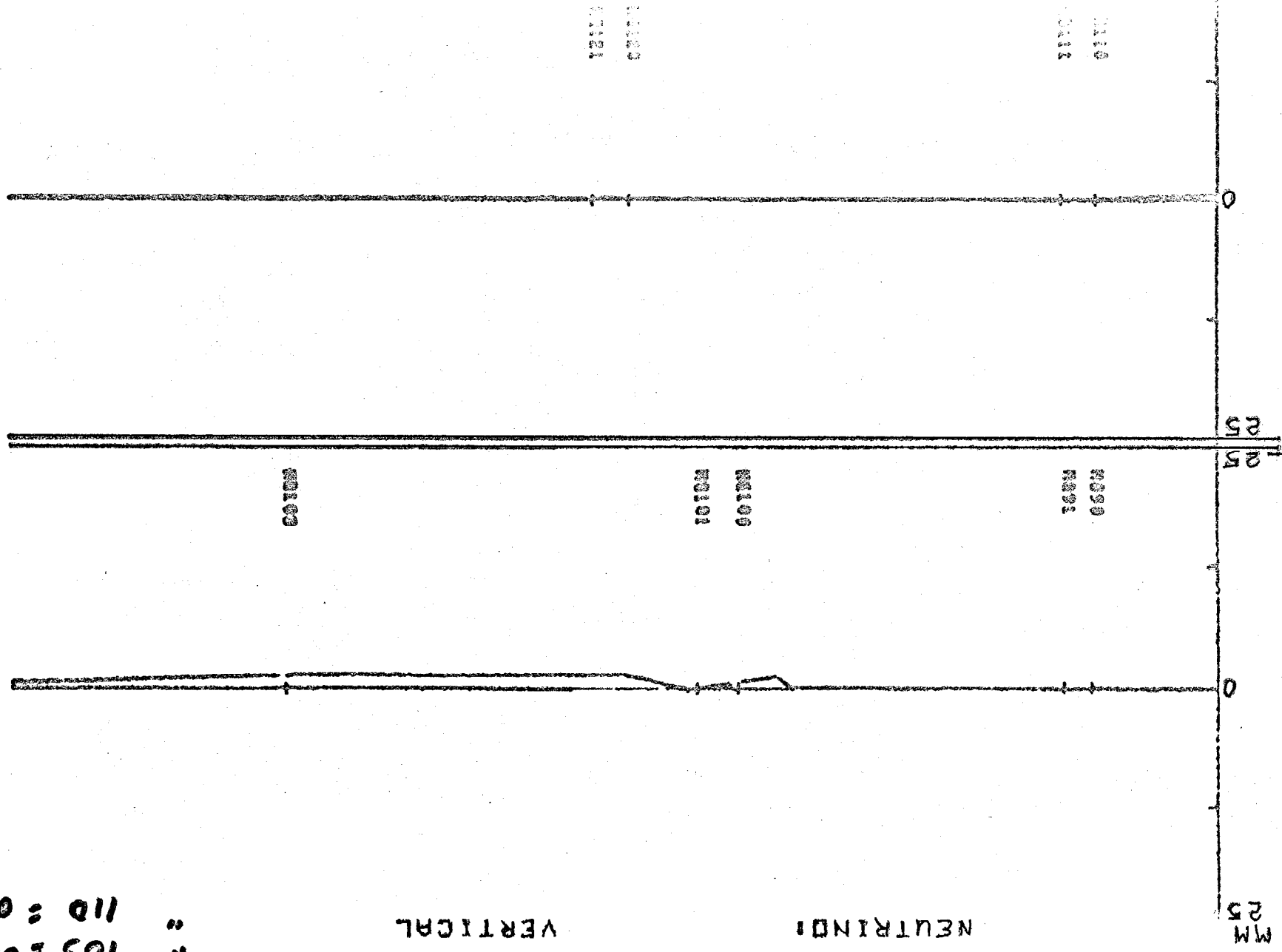


Figure 5.